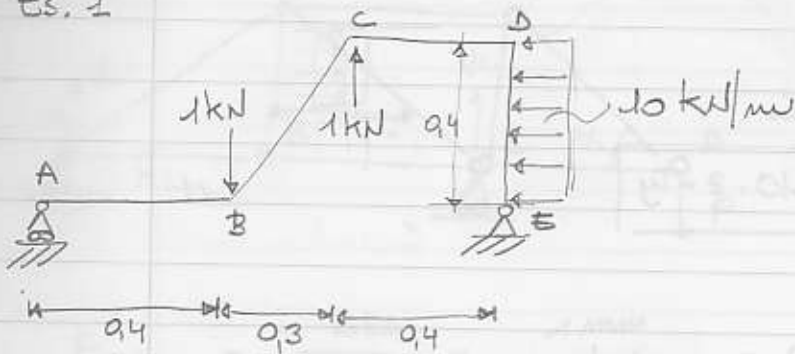
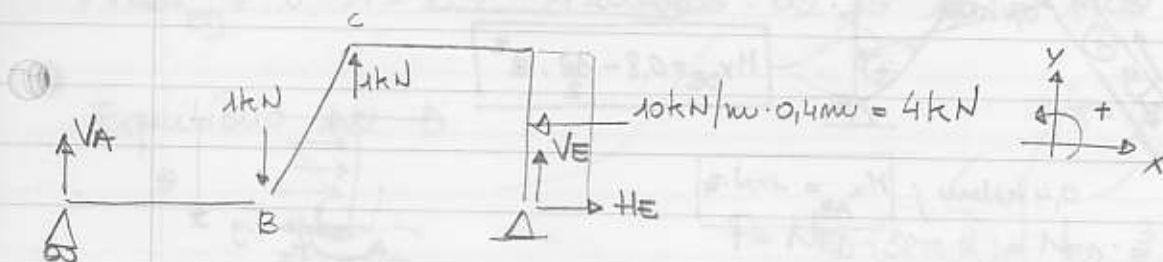


# SOLUZIONE COMPITINO 02/04/2009

Es. 1



\* CALCOLO REAZ. VINCOLARI



Eq. din. X

$$H_E - 4kN = 0 \Rightarrow H_E = 4kN$$

Eq. direzione Y

$$V_A - 1kN + 1kN + V_E = 0$$

Eq. rotaz. intorno ad E

$$-V_A \cdot (0.4 + 0.3 + 0.4) + 1kN \cdot (0.4 + 0.3) - 1kN(0.4) - 4kN \cdot 0.2 = 0$$

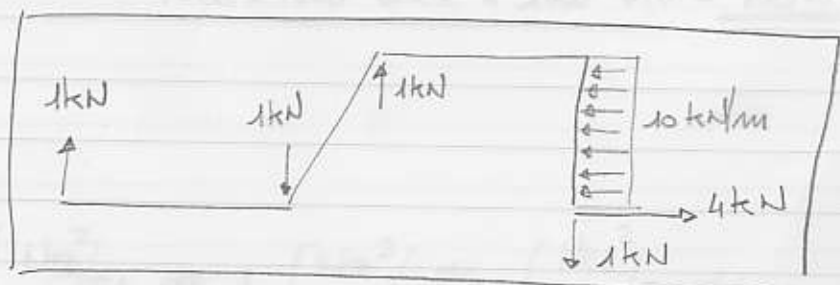
↓

$$-V_A \cdot 1.1 + 0.7 - 0.4 + 0.8 = 0$$

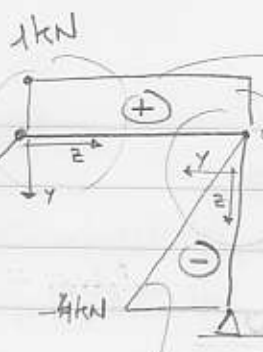
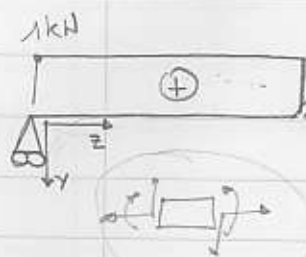
$$\Rightarrow V_A = 1kN$$

$$\Rightarrow V_E = -1kN$$

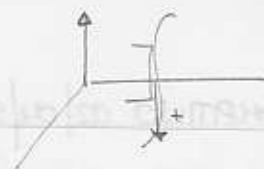
⇒ Schema CORPO LIBERO



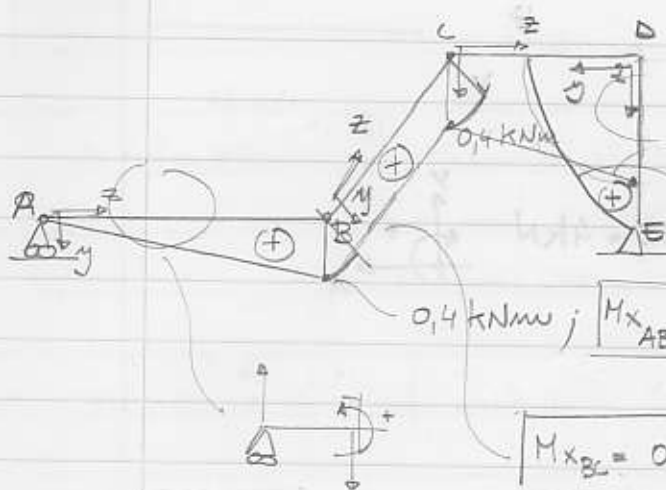
TAGLIO  $T_y$



$$-10 \cdot z = T_y$$



Momento  $M_x$



$$0,8 \text{ kNm}$$

$$M_{x_{CD}} = 0,4 + 1 \cdot z$$

$$M_{x_{DE}} = 0,8 - \frac{10}{2} \cdot z^2$$

$$0,4 \text{ kNm}; M_{x_{AB}} = 1 \text{ kN} \cdot z$$

$$M_{x_{BC}} = 0,4 \text{ kNm}$$



$$M_x = M_{x_D} - q \cdot \frac{z^2}{2}$$

$$10 \cdot 1 = 5H \Rightarrow 0 = 4H - 5H \Rightarrow H = 10 \text{ kN}$$

$$\sum \text{for vertical: } \uparrow + \downarrow = 0$$

$$\sum \text{for horizontal: } \rightarrow + \leftarrow = 0$$

$$- (10 \cdot 10) + (50 \cdot 10) + (10 \cdot 10) - 4H = 0$$

$$0 = 5H + 4H + 10H - 4H$$

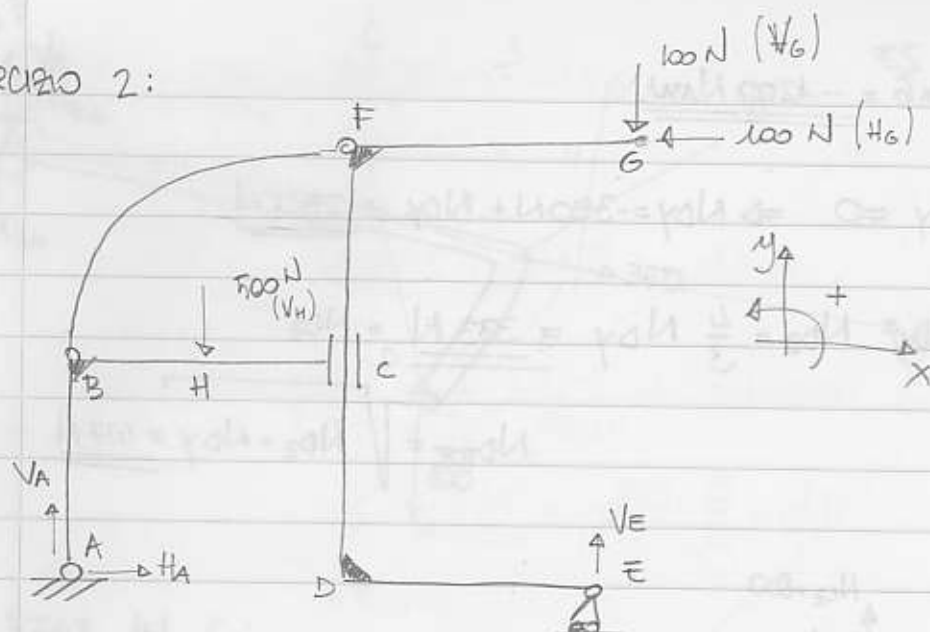
$$0 = 80 + 10 - 50 + 10 - 4H$$

$$10 = 4H \Rightarrow H = 2,5 \text{ kN}$$



$$10 \cdot 1 = 5H \Rightarrow 0 = 4H - 5H \Rightarrow H = 10 \text{ kN}$$

# ESERCIZIO 2:



\* REAZ. VINCOLARI

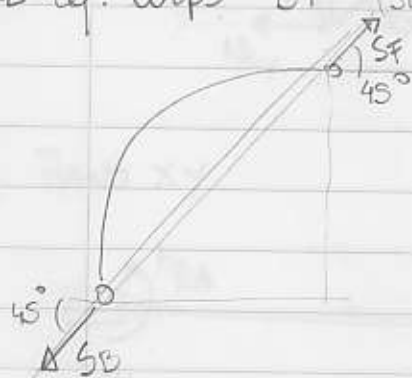
$$H_A - H_G = 0 \Rightarrow H_A = H_G = 100 \text{ N}$$

$$V_A + V_E - V_H - V_G = 0$$

$$V_H \cdot 0,75 \text{ m} + H_A \cdot 1 - V_A \cdot 1 = 0 \Rightarrow V_A = 500 \cdot 0,75 + 100 \cdot 1 = 475 \text{ N}$$

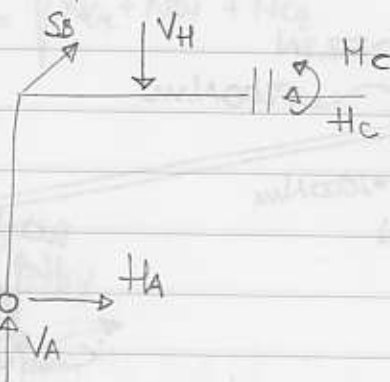
$$V_E = V_H + V_G - V_A = 500 + 100 - 475 = 125 \text{ N}$$

$\Rightarrow$  Eq. corps BF (senico)



$$S_B = S_F = 25 \sqrt{2} \text{ N}$$

Eq. corps ABHC



$$x: H_A + S_B \cdot \frac{\sqrt{2}}{2} - H_G = 0$$

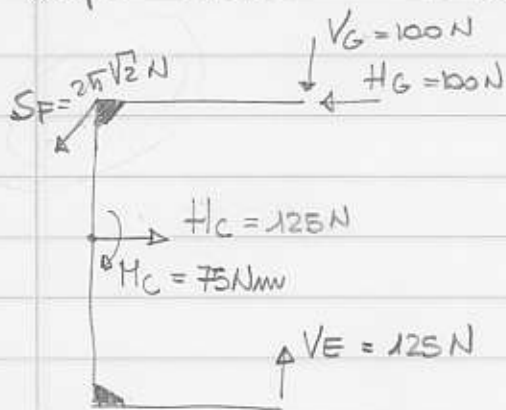
$$y: V_A + S_B \cdot \frac{\sqrt{2}}{2} - V_H = 0 \Rightarrow S_B = (V_H - V_A) \cdot \sqrt{2} = 25 \cdot \sqrt{2} \text{ N} = S_B$$

$$\text{not}_B: M_C - V_H \cdot 0,25 + H_A \cdot 0,5 = 0$$

$$\Rightarrow H_C = 0,25 V_H - 0,5 \cdot H_A = 125 - 50 = \underline{\underline{75 \text{ Nm}}} = H_C$$

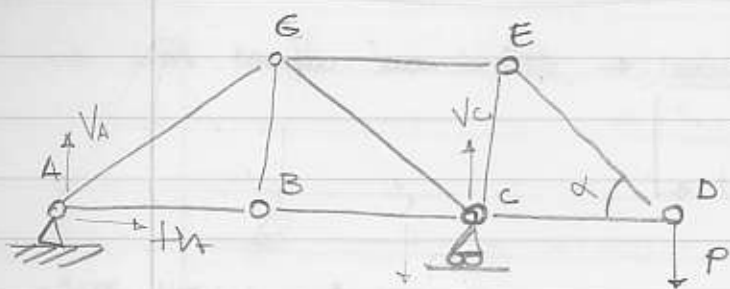
$$\rightarrow \text{Da eq. lungo X} \quad H_C = +H_A + S_B \cdot \frac{\sqrt{2}}{2} = +100 + 25 = \underline{\underline{+125 = H_C}}$$

Eq. corps CDEFG  $\rightarrow$  Ho tutte le forze note dai calcoli precedenti



OK

# ESERC. 3



$$\Delta_{ED} = 1 \text{ mm}$$

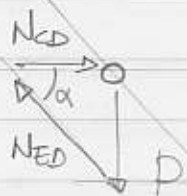
$$l_{ED} = \sqrt{3^2 + 4^2} = 5 \text{ mm}$$

$$\epsilon_{\max ED} = \frac{\Delta_{ED}}{l_{ED}} = \frac{1 \text{ mm}}{5000 \text{ mm}} = 0,2 \cdot 10^{-3}$$

$$N_{\max ED} = \sigma \cdot A = E \cdot \epsilon \cdot A = 70000 \cdot 0,2 \cdot 10^{-3} \cdot 100 = 1400 \text{ N}$$

Equilibrio in D

$$3/5 = 0,6$$

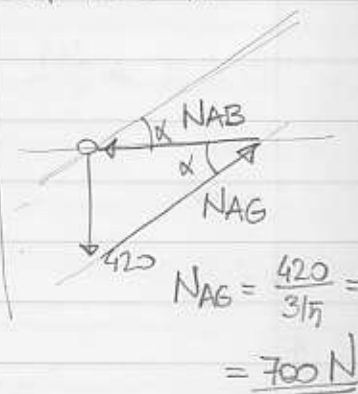


$$P = N_{ED} \cdot \sin \alpha = N_{ED} \cdot \frac{3}{5} = 1400 \cdot 0,6 = \underline{\underline{840 \text{ N}}}$$

Calcolo Allungamento:

$$\begin{aligned} \text{Reaz. Vinc. } y \left\{ \begin{aligned} -P + V_A + V_C &= 0 \Rightarrow V_C = 1260 \text{ N} \\ H_A &= 0 \end{aligned} \right. \\ \text{Rot c } \left\{ \begin{aligned} -V_A - 2P &= 0 \Rightarrow V_A = -420 \text{ N} \end{aligned} \right. \end{aligned}$$

Eq. nodo A



Eq. nodo E



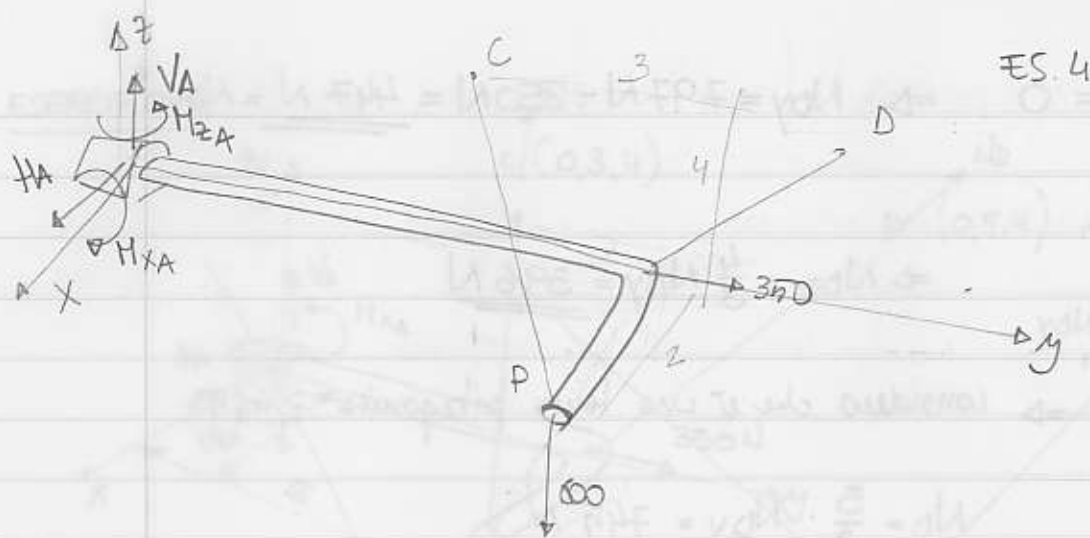
$$\begin{aligned} N_{EG} &= N_{ED} \cdot \cos \alpha = 1400 \cdot 0,8 = \underline{\underline{1120 \text{ N}}} \\ N_{CE} &= N_{ED} \cdot \sin \alpha = 1400 \cdot 0,6 = \underline{\underline{840 \text{ N}}} \end{aligned}$$

Abbassamento:

$$P \cdot \delta = \int_{GA} N_{AG}^2 / EA \, dx + \int_{DE} N_{ED}^2 / EA \, dx + \int_{CE} N_{CE}^2 / EA \, dx + \int_{EG} N_{EG}^2 / EA \, dx =$$

$$= \frac{1}{EA} \cdot \left[ \left( 700^2 \cdot 5000 \right) + \left( 1400^2 \cdot 5000 \right) + \left( 840^2 \cdot 3000 \right) + \left( 1120^2 \cdot 4000 \right) \right] \cdot P \cdot \sqrt{}$$

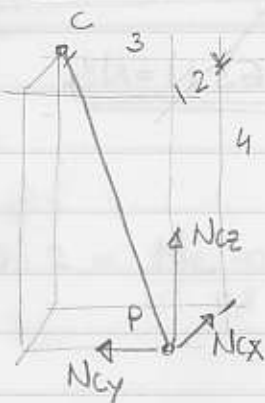
$$\Rightarrow \delta = \frac{1}{PEA} \dots = \underline{\underline{3,29 \text{ mm}}}$$



→ REAZ. IN C:

→ la reazione del cavo  $\overline{CP}$  è l'unica cosa che mi impedisce la rot. rispetto  $y$ .

↳  $N_{Cz} = 800 \text{ N}$  di conseguenza

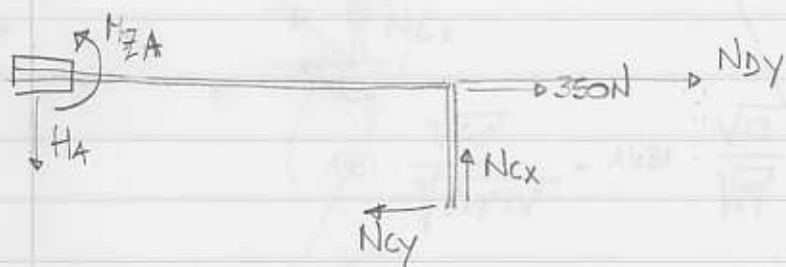


$$N_{Cx} = \frac{2}{4} \cdot N_{Cz} = \underline{\underline{400 \text{ N}}}$$

$$N_{Cy} = \frac{3}{4} \cdot N_{Cz} = \underline{\underline{600 \text{ N}}}$$

$$N_{COT} = \sqrt{N_{Cx}^2 + N_{Cy}^2 + N_{Cz}^2} = \underline{\underline{1077 \text{ N}}}$$

PIANO XY



$$\sum F_x: H_A - N_{Cx} = 0 \Rightarrow \underline{\underline{H_A = 400 \text{ N}}}$$

$$\sum M_z: M_{ZA} + N_{Cx} \cdot 6 - N_{Cy} \cdot 2 = 0$$

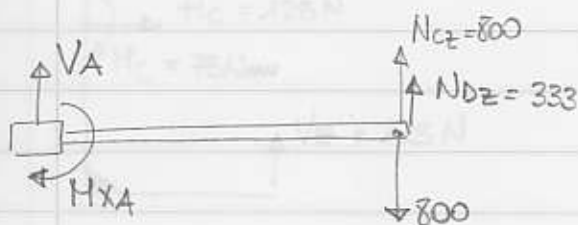
$$\Rightarrow M_{ZA} = 600 \times 2 - 400 \times 6 = \underline{\underline{-1200 \text{ Nm}}}$$

$$Y: -N_{CY} + 350 \text{ N} + N_{DY} = 0 \Rightarrow N_{DY} = -350 \text{ N} + N_{CY} = \underline{\underline{250 \text{ N}}}$$

$$\hookrightarrow \text{Ritorno } N_{DZ} \text{ perché } N_{DZ} = \frac{4}{3} N_{DY} = \underline{\underline{333 \text{ N}}} = N_{DZ}$$

$$N_{\text{TOT}} = \sqrt{N_{DZ}^2 + N_{DY}^2} = \underline{\underline{417 \text{ N}}}$$

PIANO YZ

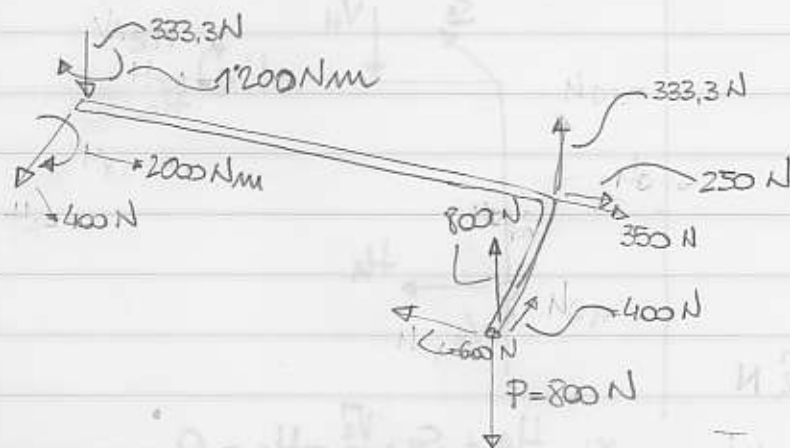


$$V_A + N_{CZ} + N_{DZ} - 800 = 0 \Rightarrow \underline{\underline{V_A = -333 \text{ N}}}$$

$$-M_{ZA} + N_{DZ} \cdot 6 = 0 \Rightarrow \underline{\underline{M_{ZA} = 2000 \text{ Nm}}}$$

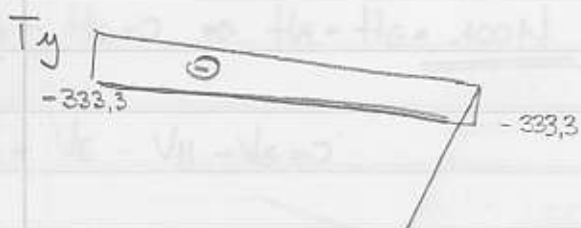
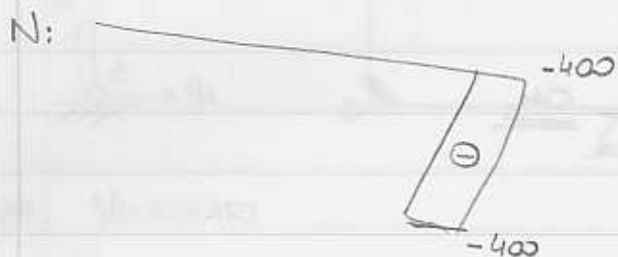
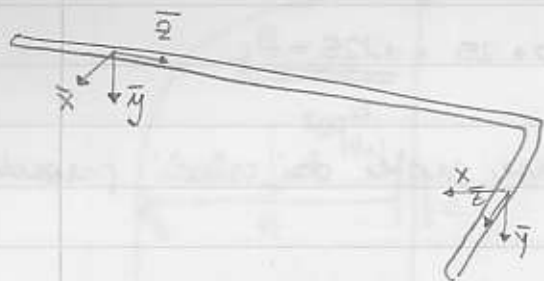
Ho trovato le 4 rest. vincoli della cerniera e i fili dei cavi -

— DIAGR. DI CORPO LIBERO CON VERSI GIUSTI



- DAGR. CORPO LIBERO

$N, T_y, M_z$



per corpo BF (senza)

Eq. corpo ABHC

$$S_B = S_C = 25 \sqrt{2} \text{ N}$$

$$\sum M_A + S_C \cdot \frac{\sqrt{2}}{2} - H_C = 0$$

$$\sum V_A + S_C \cdot \frac{\sqrt{2}}{2} - V_A = 0 \Rightarrow S_C = (V_A - H_A) \sqrt{2}$$

$$= 25 \sqrt{2} \text{ N}$$

$$\text{inf}_y: H_C - V_A \cdot 0.25 = 0 \Rightarrow 0.5 \text{ m}$$